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SpaceCRAF: A Civil Reserve Air Fleet For Space-Based Capabilities

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To increase flexibility in the uncertain international environment that lies ahead, DoD must shift how supports warfighter needs from buying space systems to buying space capabilities. U.S. Government (USG) failure to meet warfighters' space-based requirements exposes risks in the years ahead, necessitating a new USG approach based on the Civil Reserve Air Fleet system for presenting space-based capability. Any new method must reduce costs and inefficiencies, forge closer relationships with commercial space providers and in doing so decrease costs, increase agility, sustain the space industrial base, and enhance deterrence. A unique and significant part of the nation's air mobility resources is the Civil Reserve Air Fleet (CRAF). Selected aircraft from U.S. airlines, which are contractually committed to the CRAF program, augment Department of Defense (DoD) airlift requirements in emergencies. A similar program could be developed for DoD's space requirements, implement significant portions of the President's Space Policy, and reduce dependence on the spot market for communications purchases, the government's addiction to exquisite technologies, and the U.S. government's need for access to spacelift.

SpaceCRAF: A Civil Reserve Air Fleet For Space-Based Capabilities

In a May 2010 speech at the Eisenhower Memorial Library in Abilene, Kansas, Secretary of Defense Robert M. Gates predicted a new future for the Department of Defense (DoD), after a "gusher of defense spending" that followed the attacks of September 11th, 2001. "Military spending on things large and small," he said, "can and should expect closer, harsher scrutiny. The gusher has been turned off, and will stay off for a good period of time . . . . it's a simple matter of math."[1] Echoing these themes in February 2011, the DoD's top weapons buyer, Under Secretary of Defense for Acquisition, Technology and Logistics Ashton Carter, stated: "We are entering a new era in defense [where] we won't have the ever-increasing defense budgets of the past decade and need to be attentive to the nation's other needs . . . . Currently about half of our prime contract spending is in the services sector . . . ."[2]

To increase flexibility in the uncertain international environment that lies ahead, the DoD must shift how it uses space to support warfighter needs from buying systems to buying capabilities. U.S. Government (USG) failure to meet warfighters' space-based requirements exposes risks in the years ahead, necessitating a new USG approach based on the Civil Reserve Air Fleet system for presenting space-based capability. To prepare, if DoD starts considering moving bits across the heavens as space cargo, it can adopt a system already in place for air cargo to better prepare for the contingency operations we cannot predict. Any new method must reduce costs and inefficiencies,

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forge closer relationships with commercial space providers and in doing so decrease costs, increase agility, sustain the space industrial base, and enhance deterrence.[3]

New National Space Policy Drives Changes

A month after Gates' Eisenhower Library speech, President Barack Obama released his National Space Policy, the first space policy released so early in a presidential administration. Part of the reason for the new policy, officially designated Presidential Policy Directive 4, was recognition at the highest levels of the USG that space is now critical to the American way of life.[4] The policy laid out several guidelines for the commercial space sector, among them:

Purchase and use commercial space capabilities and services to the maximum practical extent when such capabilities and services are available in the marketplace and meet United States Government requirements;

Modify commercial space capabilities and services to meet government requirements when existing commercial capabilities and services do not fully meet these requirements and the potential modification represents a more cost-effective and timely acquisition approach for the government;

Actively explore the use of inventive, nontraditional arrangements for acquiring commercial space goods and services to meet United States Government requirements, including measures such as public-private partnerships, hosting government capabilities on commercial spacecraft, and purchasing scientific or operational data products from commercial satellite operators in support of government missions;

Develop governmental space systems only when it is in the national interest and there is no suitable, cost-effective U.S. commercial or, as appropriate, foreign commercial service or system that is or will be available;

Refrain from conducting United States Government space activities that preclude, discourage, or compete with U.S. commercial space activities, unless required by national security or public safety;

Pursue potential opportunities for transferring routine, operational space functions to the commercial space sector where beneficial and cost-effective, except where the government has legal, security, or safety needs that would preclude commercialization . . .[5]

Increased international engagement is also a major part of PPD-4. The second goal states the United States should

Expand international cooperation on mutually beneficial space activities to: broaden and extend the benefits of space; further the peaceful use of space; and enhance collection and partnership in sharing of space-derived information.[6]

Just seven months after announcement of the President's policy, Gates and Director of National Intelligence James R. Clapper released a strategy to implement the policy for National Security Space assets.[7] In this strategy, they acknowledged the dependence of the USG on space but also recognized the domain's changing nature: "Space, a domain that no nation owns but on which all rely, is becoming increasingly congested, contested, and competitive."[8] In order to support a U.S. space industrial base that needs to be "robust, competitive, flexible, healthy, and delivers reliable space capabilities on time and on budget," the national security sector needs to "explore a mix

of capabilities with shorter development cycles to minimize delays, cut cost growth, and enable more rapid technology maturation, innovation, and exploitation."[9]

Specifically, the president's space policy issues implementation guidance for international approaches to the executive branch agencies with responsibilities for space programs. This includes trying to strengthen U.S. space leadership, identifying areas for potential international cooperation, and developing transparency and confidence-building measures (TCBMs).[10] With the United States "going it alone" in space less frequently and relying more on partners, U.S. space capabilities will become more resilient, more dispersed, and more easily replenished because they use state-of-the-world technology. State-of-the-art constellations also can be augmented with state-of-the-world capabilities to make these important capabilities more resilient. These state-of-the-world capabilities could be partners' capabilities like an ally's satellite communications (SATCOM) constellation or a multi-national partnership such as the Wideband Global Communications System (WGS) constellation. The state-of-the-world capabilities could be better integrated into U.S. capabilities than allied capabilities are today.[11]

Another advantage of improved cooperation at the state-of-the-world level is that international cooperation complicates an adversary's targeting calculus. Why attack a Luxembourg-flagged satellite that carries U.S. military communications when such an attack could constitute an attack on the North Atlantic Treaty Organization (NATO)? Why attack a satellite when your military is also a customer of that provider? Alliance dynamics can lead to lowest-common-denominator outcomes but more cooperation with allies and commercial partners at the very least means adversaries have more potential

enemies to sort out. Since commercial SATCOM platforms typically support a host of international users including U.S. forces, the political costs and escalatory risks of carrying out attacks on those assets might deter an opponent from disrupting SATCOM unless the conflict escalated to a higher level.[12]

During the 2009 Schriever Wargame, using commercial systems was important in maintaining coalition military space capabilities as coalition assets were degraded or denied during the scenario. However, the government decision makers did not have mechanisms to allow the coalition to make best use of commercial assets. In addition, the adversary recognized the value of commercial assets and effectively used them for their own purposes against the allied coalition by buying up available bandwidth on the spot market before the coalition could, taking away the coalition's access to surge capability. According to the Joint Force Component Commander for Space, Air Force Lieutenant General Larry James, "the results clearly showed the need to develop better concept[s] of operations for integrating commercial capabilities and to have 'on the shelf' plans and agreements that allow this utilization during heightened tensions and hostilities. It also reconfirmed the need to better manage commercial satellite communication capabilities and how we procure these services."[13]

A case can be made for both government and industry that closer cooperation is mutually beneficial. As the two work together, technical capability increases will lead to capacity increases, which will reduce cost per bit transmitted and received. Security of communications will increase through focused beams. Space situational awareness about adjacent payloads will increase, which would decrease radio frequency interference (RFI) or blue-on-blue jamming from adjacent satellites using the same

frequencies. New products will be exploited faster and more cheaply like the new mobile services sector for communications-on-the-move, supporting highly mobile warfighters. Also, as government and industry work more closely, there can be technical and programmatic resource management improvements. Industry can fill in unused gaps in coverage, increasing the number of users per transponder and providing more antennas for special users. In addition, industry could exploit switchable military-commercial frequencies to sustain their sales through low periods of government use, enabling more flexible and efficient resource management. Both sides could also develop alternative business arrangements for investment or sharing, leading to decreased costs for operations, sustainment, and eventually, their entire enterprise, whether military satellite communications (MILSATCOM) or remote sensing. Some of these approaches, however, would require the government to use some commercial processes to meet government equities.[14]

While some DoD leaders have concerns about the DoD's dependence on the private sector, others appreciate a close government-industry relationship: "At the end of the day, it's a great thing," said Marine Corps General James Cartwright, Vice Chairman of the Joint Chiefs of Staff, responding to a question from a defense reporter about whether the military's dependence on commercial bandwidth is "good, bad or unimportant." "As we move to more exquisite sensors, the demand for high-definition video is substantially greater, so we have to move to mediums and compression algorithms that will allow us to do that," he said after remarks he made during the Armed Forces Communications and Electronics Association (AFCEA) conference in San Diego

in February 2010. “The good news is that the industry is leading that. I don’t have to go invent it.”[15]

Commercial Marketplace is Ready

Global commercial space capabilities are significant and growing steadily. There were 23 commercial launches worldwide in 2009 and forecasts project an increase up to 29 launches during 2010. In the geostationary market, demand averages about 20 satellites per year (or about 15 launches annually after accounting for dual-manifested missions) and has remained fairly stable.[16] Global satellite industry revenues, dominated by satellite services, totaled $160.9 billion in 2009 while all global space activity (including government spending) was $261.61 billion in 2009.[17] In the decade between 1996 and 2006 the satellite services sector more than tripled in size, generating up to 60 percent of the global satellite industry’s total revenues.[18]

Europe and the United States remain the leaders in providing commercial services from space, but with China’s return to the commercial launch marketplace and other countries’ development of heavy launchers, most notably India, this leadership will change. In launch, this has already occurred as the United States is no longer competitive in providing commercial launch services, having ceded this role to Europe’s Arianne and Russia’s Proton. United Launch Alliance, the only current U.S. commercial launch provider, launches both Boeing’s Delta IV and Lockheed’s Atlas V evolved expendable launch vehicles (EELVs), but has prices that are unattractive to commercial customers.[19]

The commercial marketplace is mature and efficient, especially with respect to SATCOM, growing more so in remote sensing and ground operations. Closer

government-commercial cooperation offers the potential for cost savings, greater availability of different space capabilities, more rapid throughput of information, service provider diversity and therefore improved mission assurance and technology risk reduction, as well as prospects for strengthening deterrence against attacks by increasing the number of actors that potential attackers must confront.[20]

The U.S. military has become dependent on commercial SATCOM capabilities to supplement its own. Prior to Operation Enduring Freedom (OEF) in September 2001, U.S. Central Command's (USCENTCOM) AOR was predominately supported via military satellite communications (MILSATCOM). There were limited commercial SATCOM links via commercial terminals during the late 1990s and early 2000s and SATCOM requirements were mainly short duration and only in support of the no-fly zones over Iraq, thus needs were met via MILSATCOM resources and not commercial SATCOM leases.[21] Today, industry experts estimate that 80 percent of all satellite bandwidth used by the Defense Department is purchased by the Defense Information Systems Agency (DISA) from commercial SATCOM companies.[22] That percentage is expected to decrease in the near future as DoD launches organic MILSATCOM systems like (WGS and Advanced Extremely High Frequency (AEHF) and adds military transponders as hosted payloads on commercial spacecraft. In the long run, commercial requirements may further decrease as U.S. forces return to their garrisons.

New, organic MILSATCOM will meet some needs currently filled by commercial SATCOM (COMSATCOM). For example, the first WGS satellite provided more bandwidth than the entire DSCS constellation, which the WGS constellation is designed to replace. Peter Stauffer, director of the Wideband SATCOM Division at the U.S.

Army's Space and Missile Defense Command (SMDC/ARSTRAT), spoke about WGS's improvements over DSCS. "WGS provides a quantum leap in capabilities – not only in throughput but in operational flexibility," he said. "The ability for the warfighter to exchange information faster using higher data rates, and more efficiently, with the ability to reach different locations simultaneously is part of the inherent capability of WGS. Data, full motion video, maps, voice and imagery will be received and transmitted by warfighters at all levels – tactical, operational and strategic."[23] When the WGS constellation is complete, currently planned at six satellites, it is expected to be in use for a decade or more. Similarly, the first AEHF satellite will provide more capacity than the entire Milstar constellation, providing protected, anti-jam, high-data-rate communications. The Pentagon's Selected Acquisition Reports outline six satellites in the AEHF constellation. The first satellite will provide a five-fold increase in the number of terminals serviced, said Col William Harding, vice commander for the organization that oversees MILSATCOM procurement at the Space and Missile Systems Center (SMC).[24] Both SATCOM systems included Allies in the developmental phases of the programs.

However, although new organic MILSATCOM capabilities will make the U.S. government (USG) less dependent on commercial SATCOM in future steady-state operations, the requirement to have a surge capability remains. In fiscal year (FY) 2008, DoD spent $924.8 million on commercial SATCOM.[25] The bulk of this expenditure was for commercial SATCOM services bought on the spot market; these are one-year leases for commercial service funded by non-recurring annual defense appropriations. Yet even as the U.S. curtails long-term overseas operations in favor of more short-term

contingency deployments, warfighters have an ever-increasing appetite for communications bandwidth and other space-related products and services. For example, the Secretary of Defense directed 65 MQ-1 Predator UAV and MQ-9 Reaper UAV orbits by 2013 in support of ongoing operations in Afghanistan. These remotely-piloted vehicles are entirely dependent on commercial SATCOM for operations and delivery of intelligence.[26] In March 2011, the Pentagon terminated DoD access to popular streaming video websites including YouTube at the request of US Pacific Command to meet the needs of the military in operations following the Japanese earthquake/tsunami because there was not enough bandwidth available.[27] Having the ability to surge is important but it does not have to be MILSATCOM.

The advantage of the spot market is its flexibility: services can be bought or sold for immediate delivery or future delivery and prices closely follow demand and availability. These attributes are also disadvantages: the spot market lets the government buy bandwidth as needed but costs are unpredictable. Relying on the spot market for future bandwidth delivery is highly speculative and exposes the government to the risk of unfavorable changes in bandwidth costs. Industry estimates suggest that more than 70 percent of the commercial bandwidth acquired by the U.S. military is paid for via supplemental funding poured into the spot market instead of being a line item in each Service's annual budget. This approach is not an incentive to reduce costs and may actually drive up costs.[28]

The U.S. Navy is the only military service that has a budget line for commercial SATCOM because Navy officials understood a long time ago that being out of communications while operating at sea would make it harder to compete for

MILSATCOM. As a result, the Navy permanently turned to commercial satellite communications for some requirements and made the strategic decision to budget for these requirements.[29] The Air Force and the Army, however, approach contingency SATCOM differently. The Army has predominantly used supplemental funds in the past while the Air Force's hybrid approach uses both programmed and supplemental funds. In recent years, according to a DoD report delivered to Congress in 2010, the majority, "around 75%," of funds for SATCOM were supplemental funds used to support operations in Iraq and Afghanistan.[30]

DoD prefers to own its own capabilities outright rather than lease them, determining that government satellites cost significantly less than leasing commercial capabilities. But DoD's demands are driven by conflicts, which are always subject to change, and therefore DoD cannot contract long-term services.[31] In most cases, DoD Components use COMSATCOM, not by choice but because MILSATCOM is unavailable when it is most needed.[32]

It is time for DoD to match the president and SECDEF's intentions with actions because the one thing that cannot be predicted is the contingency operation: an operation in Darfur, an earthquake in Haiti, a tsunami in Indonesia. Why buy so much additional capability for contingencies you can't predict? Contingency requirements are less predictable over the long haul than are peacetime requirements but they are just as significant to mission accomplishment.[33] Yet for years the government has been buying on the spot market to support immediate space needs, most often SATCOM. The time to prepare for contingency operations for an increasingly expeditionary military is today, before the crisis happens.

SpaceCRAF concept

A unique and significant part of the nation's air mobility resources is the Civil Reserve Air Fleet (CRAF).[34] Selected aircraft from U.S. airlines, which are contractually committed to the CRAF program, augment Department of Defense (DoD) airlift requirements in emergencies when the need for airlift exceeds the capability of military aircraft. A similar program could be developed to implement significant portions of the President's Space policy for DoD's space requirements. This program could reduce dependence on the spot market for communications purchases, the government's addiction to exquisite technologies, and the U.S. government's need for access to spacelift.

CRAF is a better approach than buying a massive fleet of dedicated airlifters because it reduces costs and forges close relationships with commercial air service providers to achieve a regular, habitual relationship through exchanges of information, data, and personnel. The biggest advantage for the government from this approach is the ability to diversify operations while ensuring effective and efficient use of organic, military airlift. Commercial airlift companies can gain greater insight into and predictability about government actions that often seem inconsistent to outsiders.[35]

Using commercial practices as the base for state-of-the-world national security space (NSS) requirements, the government could achieve CRAF-like advantages by reducing costs and forging closer relationships with commercial space-based capability providers to achieve a regular, habitual relationship that is not dependent on the spot market. A CRAF-like program will also reduce inefficiencies in budgeting, contracting,

technology, requirements, and launch needs, and in doing so decrease costs, increase agility, sustain the space industrial base, and enhance deterrence.

CRAF has three main segments: international, national and aeromedical evacuation.[36] The international segment is further divided into long-range and short-range sections and the national segment into the domestic and Alaskan sections. Assignment of aircraft to a segment depends on the nature of the requirement and the performance characteristics needed. The long-range international section consists of passenger and cargo aircraft capable of transoceanic operations. The role of these aircraft is to augment the Air Mobility Command's long-range intertheater C-5s and C-17s during periods of increased airlift needs, from minor contingencies up through full national defense emergencies. Medium-sized passenger and cargo aircraft make up the short-range international section supporting near offshore airlift requirements. The aircraft in the Alaskan section provide airlift within U.S. Pacific Command's area of responsibility, specific to Alaska needs. The domestic section is designed to satisfy increased DoD airlift requirements in the U.S. during an emergency.

The airlines contractually pledge aircraft to the various segments of CRAF, ready for activation when needed. To provide incentives for civil carriers to commit aircraft to the CRAF program and to assure the United States of adequate airlift reserves, the government makes peacetime DoD airlift business available to civilian airlines that offer aircraft to the CRAF. DoD offers business through the International Airlift Services Contract. For fiscal 2007, the guaranteed portion of the contract was $379 million. The U.S. Air Force’s Air Mobility Command (AMC), which does the contracting to fulfill U.S. transportation needs, estimates that throughout fiscal 2007 it also awarded more than

$2.1 billion in additional business that was not guaranteed but was additional business that went to CRAF carriers.[37] As of May 2007, 37 carriers and 1,364 aircraft were enrolled in the CRAF. This included 1,273 aircraft in the international segment (990 in the long-range international section and 283 in the short-range international section), and 37 and 50 aircraft, respectively, in the national and aeromedical evacuation segments and 4 aircraft in the Alaskan segment. These numbers fluctuated on a monthly basis.

Similarly, the SpaceCRAF should have three main segments: satellite communications, remote sensing, and launch. The SATCOM segment could be further divided into the various military frequency bands. Assignment of spacecraft to a band would depend on the nature of the requirement, the expected levels and likelihood of emergency use, the spacecraft capabilities and capacities for on-orbit systems and systems in development, and the performance characteristics needed, e.g., large bandwidth, secure links, etc. The remote sensing segment could be similarly subdivided by the various available resolutions or methodologies, e.g. electro-optical or synthetic aperture radar. The spacelift segment could be subdivided by lift capabilities or launch site.

To join CRAF, an air carrier must maintain a minimum commitment of 30 percent of its CRAF capable passenger fleet and 15 percent of its CRAF capable cargo fleet. Aircraft committed must be U.S.-registered, and carriers also must commit and maintain at least four complete crews for each aircraft. Carriers with aircraft whose performance does not meet minimum CRAF requirements are issued a certificate of technical ineligibility so they can still compete for government airlift business.[38]

In order to participate in the SpaceCRAF program, the commercial service providers would contractually pledge transponders in the various military frequency bands of SpaceCRAF, ready for activation when needed. To provide incentives for commercial carriers to commit transponders to the SpaceCRAF program, and to assure the United States of adequate SATCOM reserves, the government would make peacetime DoD SATCOM business available first to commercial SATCOM companies that offer transponders to the SpaceCRAF.

DoD currently offers business through the Future COMSATCOM Services Acquisition (FCSA) Program but already the DoD is experiencing sticker shock in new costs, seeing as great as a 300 percent increase in commercial satellite communications capacity. FCSA is a recent agreement with the Defense Information Systems Agency (DISA) through which the General Services Administration manages the purchase of satellite services for federal agencies.[39] DoD also purchases services through the program.[40] FCSA may be a good start, but many believe it is just a short-term acquisition fix rather than a more explicit strategic commitment by DoD to the commercial SATCOM industry upon which it relies. As noted previously, this approach has only been accepted thus far by the U.S. Navy, which has chosen to budget annually for spot market SATCOM purchases to support the fleet.[41]

Three stages of incremental activation allow for tailoring an airlift force suitable for the contingency at hand. Stage I is for minor regional crises, Stage II is for major theater war and Stage III is for periods of national mobilization. The commander, U.S. Transportation Command, with approval of the Secretary of Defense, is the activation authority for all three stages of CRAF. During a crisis, if AMC has a need for additional

aircraft, it would request the commander of USTRANSCOM take steps to activate the appropriate CRAF stage. Each stage of CRAF activation is only used to the extent necessary to provide the amount of civil augmentation airlift needed by DoD. When notified of call-up, the carrier must have its aircraft ready for a CRAF mission 24 to 48 hours after the mission is assigned by AMC. The air carriers continue to operate and maintain the aircraft; however, AMC directs aircraft missions.[42]

A good place to start to build a SpaceCRAF capability is SATCOM. To join SpaceCRAF, companies must maintain a certain minimum commitment of its SpaceCRAF capable fleet. The standard in air cargo is 30 percent and that could be applied as 30 percent of available bandwidth for SATCOM or 30 percent of available time for remote sensing, for example. Spacecraft committed need not be U.S.-registered satellites – currently the only U.S.-flagged COMSATs belong to SiriusXM, DishNetwork and DirectTV, which are only over North America – but would certainly need to have a U.S. license to broadcast. Carriers with spacecraft whose performance does not meet minimum SpaceCRAF requirements would be issued a certificate of technical ineligibility so they can still compete for government SATCOM business if they have a U.S. license.

Three stages of incremental SpaceCRAF activation would allow for tailoring a SATCOM capability suitable for the contingency at hand. Stage I would be used for minor regional crises, Stage II would be used for major theater war and Stage III would be used for periods of national mobilization. The Secretary of Defense (SECDEF) would delegate SpaceCRAF activation authority to the Commander of U.S. Strategic Command (CDRUSSTRATCOM) for all three stages of CRAF. During a crisis, if DoD

has a need for additional SATCOM, an agency would request CDRUSSTRATCOM take steps to activate the appropriate SpaceCRAF stage.

Each stage of the SpaceCRAF activation would only be used to the extent necessary to provide the amount of commercial SATCOM augmentation needed by DoD. When notified of call-up, the commercial provider would have 24 to 48 hours after the mission is assigned by DISA to have its transponders ready for a SpaceCRAF mission . Vendors would be required to preempt other paying customers so the USG could utilize the capability, potentially knocking off important commercial traffic, which in some cases might include a basketball tournament or the Super Bowl. The commercial carriers would continue to operate and maintain the spacecraft with their resources; however, DISA would assign the communications traffic across the transponders.

Information security is a paramount concern, and numerous procedures would remain in effect to ensure the SATCOM carriers with which DoD contracts afford the highest possible level of information security to DoD SATCOM traffic. Prior to receiving a SpaceCRAF contract, all carriers must demonstrate they have provided substantially equivalent and comparable commercial service for one year before submitting their offer to operate for DoD. All carriers must be fully certified and licensed Federal Communications Committee carriers and meet the stringent standards of Federal Information Security Regulations pertaining to commercial SATCOM.

In order to ensure fitness to participate in the SpaceCRAF program, a DoD survey team, composed of experienced and skilled DoD space and communications professionals would perform an on-site inspection of the commercial SATCOM carriers. This team would conduct a comprehensive inspection that includes the carrier's

spacecraft manuals, training facilities, crew qualifications, maintenance procedures, quality control practices and financial status to maximize the likelihood that the carrier would perform for DoD. After passing this survey, the carrier would be certified by DISA as DoD-approved before receiving a contract. DoD analysts, likely at DISA, would continue to monitor the carrier's information security record, operations and maintenance status, contract performance, financial condition and management initiatives, summarizing significant trends in a comprehensive review. These initiatives and the surveys are further supplemented by an open flow of information on all contract carriers between DISA and the DoD through established liaison officers.

Communications, while the largest, is only one of the commercial space markets. Until recently, only a few nations had remote sensing capability. Today, anyone with access to the Internet and a credit card can task commercial imagery satellites to photograph their house or a military formation in the desert. Actor George Clooney is a frequent user of commercial remote sensing in his work in Darfur, Sudan. Privately funded and publicly accessible (SatSentinel.org), he buys pictures of military movements in the impoverished nation. “I’m not tied to the U.N. or the U.S. government, and so I don’t have the same constraints. I’m a guy with a camera from 480 miles up,” Clooney said in a *Newsweek* interview.[43] The United States has forged close relationships with many commercial remote sensing providers, using their capabilities to fill coverage gaps, even while the commercial providers continue to support the requests of business, agriculture, mining, and other commercial needs.[44]

In the case of a remote sensing SpaceCRAF, there are two U.S. vendors – GeoEye and Digital Globe – and several international providers of commercial remote

sensing (CRS) capabilities, which are closely aligned with friendly national governments. Several companies, many foreign, provide electro-optical or synthetic aperture radar images with resolutions that were available only to governments just a decade ago.[45] A situation could be arranged that would allow the DoD or Intelligence Community to add additional taskings to these extra-U.S. CRS providers, most likely in the form of higher payments, much as a first class ticket costs more than coach on the same flight. If two customers wanted time on the satellite at exactly the same moment, the higher payer would get the capability.

In no way is the U.S. commercial launch industry as robust as U.S. aviation, even as weak as that industry is. U.S. commercial launch revenues rose slightly in 2008 to $1.1 billion but the U.S. share of worldwide launch revenues declined from 31 percent in 2007 to 28 percent in 2008. Meanwhile, U.S. satellite manufacturing revenues declined from $4.8 billion in 2007 to $3.1 billion in 2008 while its market share fell from 41 percent of the world total in 2007 to just 29 percent in 2008.[46] This data points to a waning industrial base that once gone, will be nearly impossible to rebuild as jobs and technologies migrate to other sectors or move abroad and contribute to other nations' space capabilities.[47] DoD is increasingly affected by the shrinking industrial base in the United States and work going overseas to foreign companies and competitors, a major concern in President Obama's space policy.[48] Therefore, a CRAF-like capability for launch services is much more problematic given the current state of the industry. There will be no commercial COMSATs launched from the U.S. in 2011. However, one could imagine that if the launch industry bounced back that a SpaceCRAF-like capability could

be envisioned that would bump payloads off manifests or add payloads to boosters for multi-satellite deployments.

Changes are coming in the way the United States gets astronauts to space and these changes may benefit the military-commercial partnership and someday lend themselves to a more SpaceCRAF-like arrangement. NASA's announced plan, called Commercial Orbital Transportation Services (COTS), will buy seats for astronauts aboard commercial launchers and resupply the International Space Station using non-governmental rockets. COTS commercial partners are responsible for the overall design, development, manufacturing, testing, and operation of their systems; NASA plans to purchase these services competitively once they become available. NASA's Commercial Crew and Cargo Program Office (C3PO) is working with industry to provide reliable, cost-effective cargo and crew transportation services that can serve existing markets and help develop new markets, possibly launching a new era for commercial space.[49] "If ROSCOSMOS can do it, US industry can, too," said NASA administrator Charles Bolden.[50] COTS could end up being the launch portion of the SpaceCRAF program.

Conclusions

Just as the U.S. national airlift capability is provided from military and commercial air carrier resources, so too is the national space capability provided from military and commercial space resources. Equally important, interdependent military and civil space resources must be able to meet defense surges for mobilization and deployment requirements in support of US defense and foreign policies. The advantages of a CRAF-like program for space-based capabilities include reduced costs through lower

dependence by DoD on the spot market for leased SATCOM; offering commercial providers a more predictable commitment; and faster technological improvements as the commercial providers introduce technology upgrades faster than DoD. U.S. forces will not remain overseas in the large numbers they have been for the last decade and the U.S. military's reliance on commercial providers will likely decrease as well but the need for surge capability will remain. The president's space policy declares the ends for our strategy to provide effects from space for our warfighters. SpaceCRAF is but one of the ways to ensure they have what they need when they need it.

Endnotes

[1] Robert M. Gates, "Eisenhower Library (Defense Spending)," Speech, 8 May 2010, available from http://www.defense.gov/speeches/speech.aspx?speechid=1467, accessed 11 Feb 2011.

[2] Ashton Carter, "The Defense Industry Enters a New Era," Speech, 9 February 2011, available from http://www.dodbuzz.com/2011/02/09/carter-signals-more-defense-mergers-announces-sectoral-studies/, accessed 11 Feb 2011.

[3] For an in-depth approach to curing all that ails space organization and management, see most recently Peter L. Hays, "An Agile and Adaptive Enterprise: Enhancing National Security Space by Improving Management Structures and Leveraging Commercial and International Partners," *Astropolitics* (December 2010, vol 8:2 and 8:3): 146-169, especially p. 163 for a discussion of possibilities for international cooperation. This article has been expanded for publication as David Christopher Arnold and Peter L. Hays, "Building an Agile and Adaptive National Security Space Enterprise: Improving Management Structures and Leveraging Commercial and International Partners," in Eligar Sadeh, *Space Strategy for the 21st Century* (London: Routledge, Taylor and Francis, forthcoming 2012). See also Col. David C. Arnold and Dr. Peter L. Hays, "Getting There From Here: Realizing the Space Commission's Vision Ten Years Later," *High Frontier* (forthcoming, Summer 2011, vol 7:4).

[4] "National Space Policy," 28 Jun 10, p. 5, available from http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf , accessed 5 Aug 10, p. 10.

[5] "National Space Policy," p. 10.

[6] "National Space Policy," p. 4.

[7] Ask 5 people to define National Security Space and you will likely get 6 or more definitions. However, broadly, National Security Space can be defined as all those space missions that support national security, from the seemingly routine like secure communications and assured position, navigation and timing to the more exotic like surveillance and reconnaissance from space.

[8] "National Security Space Strategy (Unclassified Summary)," p. I, available from http://www.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf, accessed 14 February 2011.

[9] National Security Space Strategy, p. 7.

[10] "National Space Policy," p. 6-7.

[11] Hays, p. 160-163.

[12] Hays, p. 163: Forrest E. Morgan, "Deterrence and First-Strike Stability in Space: A Preliminary Assessment" (Santa Monica, CA: RAND Corp., 2010), 16, cited in Hays, note 42.

[13] Hays, p. 164: Lt Gen Larry D. James, "Schriever V Wargame: The Boundaries of Space and Cyberspace," *High Frontier*, August 2009, 13, cited in Hays, note 44.

[14] Hays, p. 157: Joe Vanderpoorten, Technical Director, MILSATCOM Advanced Concepts Group, "Crack the Commercial SATCOM Paradigm–Hosted Payload Workshop," presentation, 6 April 2010, cited in Hays, note 22.

[15] Hays, p. 156-160: Barry Rosenberg, "DOD's reliance on commercial satellites hits new zenith," Defense Systems, available from http://www.defensesystems.com/Articles/2010/03/11/Cover-story-The-Satcom-Challenge.aspx, cited in Hays, note 19 and note 31.

[16] Hays, p. 155: FAA, 2010 Commercial Space Transportation Forecasts, p. 1, available from http://www.faa.gov/about/office_org/headquarters_offices/ast/media/launch_forecasts_051810.pdf, cited in Hays, note 15.

[17] Hays, p. 155-6: Satellite Industry Association and Futron Corporation, "State of the Satellite Industry Report," (Bethesda, MD: Futron Corporation, June 2010), 5; and Space Foundation, *The Space Report 2010: The Authoritative Guide to Global Space Activity* (Colorado Springs: Space Foundation, 2010), 6, cited in Hays, note 16.

[18] Hays, p. 156: Space Security Index 2009, 84, cited in Hays, note 17.

[19] Hays, p. 155-156.

[20] Hays, p. 155.

[21] Hays, p. 156: Ron Dixon, "USCENTCOM Commercial SATCOM Overview," 5 December 2006, available from http://www.sia.org/2007DoDSatcomWorkshop/Tuesday/DoD/CENTCOM.ppt, cited in Hays, note 18.

[22] Hays, p. 157: Rosenberg, cited in Hays, note 21.

[23] Ed White and Andy Roake, "First Wideband Global SATCOM Satellite goes operational," 29 April 2008, available from http://www.stratcom.mil/news/article/38/First_Wideband_Global_SATCOM_Satellite_goes_operational.

[24] Amy Butler, USAF Plans For AEHF Launch Next Week," *Aviation Week*, 5 Aug 10, available from http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=defense&id=news/asd/2010/08/04/07.xml&headline=USAF%20Plans%20For%20AEHF%20Launch%20Next%20Week.

[25] Hays, p. 156-167: USSTRATCOM/J6, "Memorandum for the Acting Deputy Assistant Secretary of Defense for Command, Control and Communications Policies and Programs and Space Programs, Subject: FY08 Commercial Satellite Communications (COMSATCOM) Usage

Report," (Offutt AFB, NE: USSTRATCOM/J6, 31 March 2010). The figures for FY08 are the most current available. Fixed Satellite Services accounted for 72.3 percent of the total expenditures in FY08; expenditures increased by 34.8 percent (from $355.5 million in FY07 to $482.7 million in FY08); and bandwidth increased 13.6 percent (from 6.5GHz in FY07 to 7.4GHz in FY08), cited in Hays, note 20.

[26] Michael B. Donley, "Fiscal Year 2012 Air Force Posture Statement," available from http://www.posturestatement.af.mil/shared/media/document/AFD-110301-088.pdf, accessed 3 March 2011, p 2.

[27] The Associated Press, "US military blocks access to video websites, cites Japan earthquake viewing, bandwidth issues," *Washington Post*, 15 March 2011, available from http://www.washingtonpost.com/us-military-blocks-access-to-video-websites-cites-japan-earthquake-viewing-bandwidth-issues/2011/03/14/ABJW2lV_story.html, accessed 15 March 2011.

[28] Hays, p. 156-7: Rosenberg, cited in Hays, note 19.

[29] Hays, p. 157: Barry Rosenberg, "DOD's reliance on commercial satellites hits new zenith," Defense Systems, available from http://www.defensesystems.com/Articles/2010/03/11/Cover-story-The-Satcom-Challenge.aspx, cited in Hays, note 19.

[30] Department of Defense, "Investment and Acquisition Strategy for Commercial Satellite Capabilities Report," 3 Jun 2010, p. 2.

[31] Dr. Ron Jost, Deputy Assistant Secretary of Defense for C3/Spectrum/Space, Department of Defense, comments to the Commercial SATCOM Owner/Operator Principals Meeting, 15 March 2010, Pentagon Conference Center, meeting notes.

[32] Department of Defense, "Investment and Acquisition Strategy for Commercial Satellite Capabilities Report," 3 Jun 2010, p. 11.

[33] Department of Defense, "Investment and Acquisition Strategy for Commercial Satellite Capabilities Report," 3 Jun 2010, p. 12.

[34] "Factsheet: Civil Reserve Air Fleet," available from http://www.amc.af.mil/library/factsheets/factsheet.asp?id=234, accessed 4 Aug 10. Descriptions of CRAF are taken from this document.

[35] Hays, p. 160.

[36] Used primarily to support the evacuation of casualties from operational theaters to hospitals in the continental United States, clearly the aeromedical evacuation segment does not have a corollary for space. These aircraft are also used to return medical supplies and medical crews to the theater of operations.

[37] Ms Sandy Halama, email to author, Subject: "Re: CRAF," 9 March 2011.

[38] "Factsheet: Civil Reserve Air Fleet."

[39] Turner Brinton, "Pentagon Seeing Sharp Price Increases for Commercial Satcom," Space News, 21 March 2011, p. 11.

[40] Elizabeth Montalbano, "GSA Releases $5 Billion Satellite Communications RFP," Information Week, July 9, 2010, available from http://www.informationweek.com/news/government/enterprise-apps/showArticle.jhtml?articleID=225702772&cid=RSSfeed_IWK_News, accessed 4 AUG 10. This leverages more than $5 billion in purchases in commercially available satellite

communications frequency bands, including L, S, C, X, Ku, extended Ku, Ka and ultra high frequency (UHF).

[41] Hays, 160: Barry Rosenberg, "DOD's reliance on commercial satellites hits new zenith," Defense Systems, available from http://www.defensesystems.com/Articles/2010/03/11/Cover-story-The-Satcom-Challenge.aspx, cited in Hays, note 19.

[42] "Factsheet: Civil Reserve Air Fleet."

[43] John Avlon, "A 21st-Century Statesman," *Newsweek*, February 21, 2011, available from http://www.newsweek.com/2011/02/20/a-21st-century-statesman.html, accessed 12 May 2011.

[44] Hays, p. 157.

[45] Hays, p. 157.

[46] Hays, p. 162: Futron Corp., "State of the Satellite Industry Report," June 2009, cited in Hays, note 38.

[47] Hays, p. 162.

[48] "National Space Policy," p. 5.

[49] Hays, p. 162: "Commercial Crew and Cargo Program Office (C3PO)," available from http://www.nasa.gov/offices/c3po/about/c3po.html, cited in Hays, note 39.

[50] Bolden, COMSTAC, 19 May 10.